

Assignment 3-1

Use implicit differentiation to find y' .

1. $x^2 + y^2 = 4$

2. $xy = 7$

3. $x^2y^3 + y = x^3$

4. $\cos x - 2\sin(2y) = 4$

5. $\tan(xy) = y^2$

6. $\sqrt{x} + \sqrt{y} = 9$

7. $y^2 = \frac{x}{x+1}$

Find $\frac{dy}{dx}$ and evaluate the derivative at the given point.

8. $x^3 - xy = 3$ at $(1, -2)$

9. $y^3 + y^2 + x^2 = 0$ at $(2, -2)$

10. $x^3 + y = 2xy$ at $(1, 1)$

11. $\sec(x+y) = x+1$ at $(0, 0)$

12. Differentiate implicitly to find the slope of the graph of $x^2 + y^2 = 25$. at the point $(3, -4)$.

13. Use explicit differentiation to find the slope of the graph of $x^2 + y^2 = 25$. at the point $(3, -4)$.

You must first solve for y . If your answer does not match the correct answer to Problem 12, find your mistake.

14. Given $x^2 + xy = 4$, find $\frac{d^2y}{dx^2}$ in terms of x and y .

~~15. Find an equation of the line tangent to the circle $x^2 + y^2 = 169$ at the point $(-12, 5)$.~~

16. Find the point(s) at which the graph of $x^2 + 2y^2 - 4y - 6 = 0$ has a horizontal tangent line.

17. Find the point(s) at which the graph of $x^2 + 2y^2 - 4y - 6 = 0$ has a vertical tangent line.

~~18. The volume formula for a sphere is $V = \frac{4}{3}\pi r^3$. Find the rate of change of the volume with respect to the radius $\left(\frac{dV}{dr}\right)$, when the radius is 4.~~

Use the figure at the right for Problems 19-26.

19. Find $\lim_{x \rightarrow 1} f(x)$.

20. Find $\lim_{x \rightarrow -3} f(x)$.

21. Find $\lim_{x \rightarrow -\infty} f(x)$.

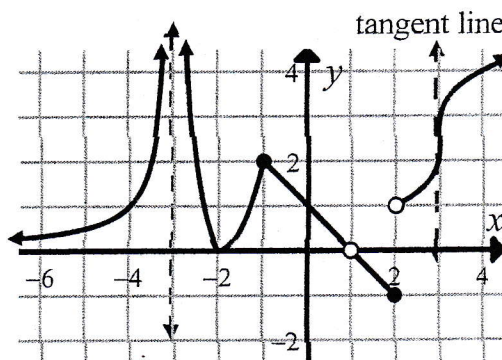
22. Find $\lim_{x \rightarrow 2} f(x)$.

23. Find $\lim_{x \rightarrow 2^+} f(x)$.

24. List the x -values of all discontinuities of $f(x)$.

25. Which of these discontinuities are removable?

26. List the x -values where $f(x)$ is not differentiable.



27. Use a calculator to solve this inequality. $2x^2 - 7x + 4 \leq 0$.

~~28. An object's velocity in meters per second is $v = 2t^3 - 9t^2 + 12t - 5$. Find the object's speed each time the acceleration is zero.~~

29. Find $\frac{d}{dx} \left(\frac{x^2 - 2x}{x^2} \right)$.

Use the function $g(x) = \begin{cases} x-1, & x \leq 0 \\ x^2-1, & 0 < x < 2 \\ 4, & x \geq 2 \end{cases}$ for Problems 30-37.

30. Sketch a graph of $g(x)$.

Find the following limits.

31. $\lim_{x \rightarrow 0} g(x)$ 32. $\lim_{x \rightarrow 2} g(x)$ 33. $\lim_{x \rightarrow 2^-} g(x)$ 34. $\lim_{x \rightarrow 1} g(x)$

35. List all discontinuities of $g(x)$.

36. Find $g'(x)$

37. List all x -values at which g is **not** differentiable.

Selected Answers

1. $y' = -\frac{x}{y}$ 2. $y' = -\frac{y}{x}$ 3. $\frac{dy}{dx} = \frac{3x^2 - 2xy^3}{3x^2y^2 + 1}$ 4. $y' = \frac{\sin x}{-4 \cos(2y)}$ 6. $y' = -\sqrt{\frac{y}{x}}$

8. $\frac{dy}{dx} = \frac{y-3x^2}{-x} = \frac{3x^2-y}{x}$, $\left. \frac{dy}{dx} \right|_{(1,-2)} = 5$ 9. $\frac{dy}{dx} = \frac{-2x}{3y^2+2y}$, $\left. \frac{dy}{dx} \right|_{(2,-2)} = -\frac{1}{2}$

10. $y' = \frac{2y-3x^2}{1-2x}$; $y'(1,1) = 1$ 12. $y'(3,-4) = \frac{3}{4}$ 14. $y'' = \frac{2x+2y}{x^2}$

15. $y-5 = \frac{12}{5}(x+12)$ 16. $(0,3), (0,-1)$ 17. $(\pm\sqrt{8}, 1)$ 18. $\frac{dV}{dr}(4) = 64\pi$

27. $.719 \leq x \leq 2.780$ (or 2.781) 28. $|v(1)| = 0 \frac{m}{sec}$, $|v(2)| = 1 \frac{m}{sec}$ 29. $\frac{2}{x^2}$

30.  31. -1 32. DNE 33. 3 34. 0 35. $x = 2$

